

1 The Claims:

2 1. A yaw, pitch and roll articulated assembly (1) for a multi-unit vehicle
3 comprised of:

4 a. a pitch assembly (100) with pitch means (130); said pitch assembly (100)
5 having pitch assembly interconnection means to a first vehicle unit (10); pitch means
6 (130) allowing a pitch relationship between the first vehicle unit (10) and a second
7 vehicle unit (20);

8 b. a yaw assembly (200) with yaw means; said yaw assembly (200) having
9 pitch-yaw assembly interconnection means of the pitch assembly (100) and the yaw
10 assembly (200); the yaw assembly (200) having yaw-roll assembly interconnection
11 means; yaw means allowing a yaw relationship between the first vehicle unit (10) and
12 the second vehicle unit (20);

13 c. a roll assembly (300) with roll means; said roll assembly (300) having yaw-
14 roll assembly interconnection means of the yaw assembly (200) and the roll assembly
15 (300) and having roll interconnection means to the second vehicle unit (20); roll
16 means allowing a roll relationship between the first vehicle unit (10) and the second
17 vehicle unit (20).

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19 2. A yaw, pitch and roll articulated assembly of claim 1 further comprising:

20 a. the pitch assembly interconnection means to a first vehicle unit (10)
21 comprised of a first pitch interconnection plate (110) affixed by interconnection
22 affixing means to the first vehicle unit (10);

23 b. the first pitch interconnection plate (110) is pitch rotatably affixed by pitch
24 interconnection affixing means (130) to a pitch assembly attachment plate (120);

25 c. the pitch assembly attachment plate (120) is immovably connected, by
26 affixing means, to at least one first yaw assembly plate (210);

27 d. the pitch-yaw assembly interconnection means of the pitch assembly (100)
28 and the yaw assembly (200) rotatably interconnecting the pitch assembly (100) with
29 the yaw assembly (200);

30 e. the roll assembly (300) having a yaw-roll interface plate (310); the yaw-roll
interface plate (310) fixedly connected, by plate affixing means, to at least one second

1 yaw assembly plate (220); the yaw-roll assembly interconnection means yaw
2 rotatably interconnecting the yaw assembly (200) with the roll assembly (300); the
3 yaw-roll interface plate (310) interconnected by roll means with a second roll
4 interconnection plate (320); the second roll interconnection plate (320) affixed by
5 plate affixing means to the second vehicle unit (20).
6
7 3. A yaw, pitch and roll articulated assembly of claim 2 further comprising:
8 a. the pitch assembly attachment plate (120) having an assembly plate first
9 side (122), an assembly plate second side (123), an assembly plate top (126) and an
10 assembly plate bottom (127);
11 b. the first pitch interconnection plate (110) affixed by rotatable pitch
12 interconnection affixing means (130) to the pitch assembly attachment plate (120) at
13 the assembly plate front side (124) proximal the assembly plate bottom (127) or at the
14 assembly plate bottom (127);
15 c. the at least one first yaw assembly plate (210) having a first yaw assembly
16 plate edge (212), an extension edge (213), a first yaw assembly plate top (214) and a
17 first yaw assembly plate bottom (215); the at least one first yaw assembly plate edge
18 (212) immovably affixed by edge affixing means at the assembly plate second side
19 (123); the extension edge (213) distal from the first yaw assembly plate edge (212);
20 the at least first yaw assembly plate (210) extending from the assembly plate second
21 side (123) outwardly from the assembly plate second side (123);
22 d. the at least one second yaw assembly plate (220) having a second yaw
23 assembly plate edge (222), a second extension edge (223), a second yaw assembly
24 plate top (224) and a second yaw assembly plate bottom (225); the at least one second
25 yaw assembly plate edge immovably affixed by edge affixing means at the yaw-roll
26 interface plate (310) at a yaw surface (314); the second extension edge (223) distal
27 from the at least second yaw assembly plate edge (222); the at least second yaw
28 assembly plate (220) extending from the yaw surface (314) outwardly from the yaw
29 surface (314); the yaw-roll interface plate (310) having a yaw-roll interface plate top
30 (311) and a yaw-roll interface plate bottom (312);
e. yaw interconnection means interconnecting the at least one first yaw

1 assembly plate (210) and the at least one second yaw assembly plate (220) proximal
2 the respective extension edge and second extension edge; yaw interconnection means
3 receiving yaw power means to urge the at least one first yaw assembly plate (210) to
4 yaw rotate with respect to the at least one second assembly plate (220).
5
6 4. A yaw, pitch and roll articulated assembly of claim 3 further comprising:
7 a. the first yaw assembly plate edge (212) immovably affixed by edge affixing
8 means at the assembly plate second side (123) intermediate the assembly plate top
9 (126) and the assembly plate bottom (127) or proximal the assembly plate bottom
10 (127); yaw interconnection means interconnecting the at least one first yaw assembly
11 plate (210) and the at least one second yaw assembly plate (220) proximal the
12 respective extension edge (213) and second extension edge (223) comprised of at
13 least one first aperture (217), from the first yaw assembly plate top (214) to the first
14 yaw assembly plate bottom (215), proximal the at least one first yaw assembly plate
15 extension edge (213), and at least one second aperture (227) from the second yaw
16 assembly plate top (224) to the second yaw assembly plate bottom (225), proximal
17 the second extension edge (223) wherein said at least one first aperture (217) and said
18 at least one second aperture (227) are aligned to receive rotatable shaft or shaft
19 interrelated with gear interconnecting means; said shaft or shaft interrelated with gear
20 interconnecting means receiving yaw power means to urge the rotation of the at least
21 one first yaw assembly plate (210) relative to the at least one second yaw assembly
22 plate (220);
23 b. the first pitch interconnection plate (110) affixed by rotatable pitch
24 interconnection affixing means (130) to the assembly plate first side (122)
25 intermediate the assembly plate top (126) and the assembly plate bottom (127) or
26 proximal the assembly plate bottom (127);
27 c. the first pitch interconnection plate (110), the pitch assembly attachment
28 plate (120), the at least one first yaw assembly plate (210), the at least one second yaw
29 assembly plate (220), the yaw-roll interface plate (310), and the second roll
30 interconnection plate (320) are substantially planar;
d. rotatable pitch interconnection affixing means (130) comprised of hinge

1 means (130); roll means comprised of first roll interconnecting means (330) received
2 by second roll interconnecting means (340).
3
4 5. A yaw, pitch and roll articulated assembly of claim 4 further comprising:
5 a. rotatable yaw power means comprised of a motor means (400) driving a
6 motor shaft (410); the motor means (400) stationarily fixed by stationary fixing
7 means at either the first yaw assembly plate top (214), the first yaw assembly plate
8 bottom (215), the second yaw assembly plate top (224) or the second yaw assembly
9 plate bottom (225); where the motor means (400) is affixed to the at least one first
10 yaw assembly plate (210) the motor shaft (410), either directly or by gear means
11 torque connected to the shaft or shaft interrelated with gear interconnection means,
12 key notch or gear interconnected to the at least one second yaw assembly plate (220);
13 where the motor means (400) is affixed to the at least one second yaw assembly plate
14 (220) the motor shaft (410), either directly or by gear means torque connected to the
15 shaft or shaft interrelated with gear interconnection means, key notch means or gear
16 means interconnected to the at least one first yaw assembly plate (210);
17 b. first roll interconnecting means (330) comprised of threaded means
18 received by second roll interconnecting means (340) comprised of complementary
19 receiving threaded means.
20
21 6. A yaw, pitch and roll articulated assembly of claim 5 further comprising:
22 a. motor means (400) yaw power to the shaft (410), key (420) and notch (425)
23 or to shaft (410) interrelated with gear means (430) interconnection at the at least one
24 first aperture (217) or at the at least one second aperture (227) urges the respective at
25 least one first yaw assembly plate (210) to yaw rotate relative to the at least one
26 second yaw assembly plate (220) responsive to power means signals received by the
27 motor means (400) at signal input means ((440); motor means comprised of electric,
28 pneumatic or hydraulic power transmitted by steering means;
29 b. first roll interconnecting means (330) comprised of threaded means
30 received by second roll interconnecting means (340) comprised of complementary
receiving threaded means; first roll interconnecting means (330) immovably affixed

1 to second roll interconnection plate (320) at a roll side (321); the second roll
2 interconnection plate (320) affixed by means to the second vehicle (20) at a roll-
3 vehicle side (322)
4

5 7. A yaw, pitch and roll articulated assembly of claim 3 further comprising:
6 a. the at least one first yaw assembly plate (210) comprised of at least at least
7 one first yaw assembly plate(210) and at least one first top assembly plate (211);
8 b. the at least one first yaw assembly plate (210) having a first yaw assembly
9 plate edge (212), an extension edge (213), a first yaw assembly plate top (214) and a
10 first yaw assembly plate bottom (215); the at least one first yaw assembly plate edge
11 (212) immovably affixed by edge affixing means at the assembly plate second side
12 (123); the extension edge (213) distal from the first yaw assembly plate edge (212);
13 the at least first yaw assembly plate (210) extending from the assembly plate second
14 side (123) outwardly from the assembly plate second side (123);
15 c. the at least one top yaw assembly plate (211) having a first yaw assembly
16 plate edge (232), an extension edge (233), a top yaw assembly plate top (234) and a
17 top yaw assembly plate bottom (235); the at least one top yaw assembly plate edge
18 (232) immovably affixed by edge affixing means at the assembly plate second side
19 (123); the extension edge (233) distal from the top yaw assembly plate edge (232);
20 the at least one top yaw assembly plate (211) extending from the assembly plate
21 second side (123) outwardly from the assembly plate second side (123);
22 d. the pitch assembly attachment plate (120) is immovably connected, by
23 immovable affixing means, to the at least one first yaw assembly plate (210) proximal
24 the assembly plate bottom (127) and the at least one first top assembly plate (211)
25 proximal the assembly plate top (126);
26 e. the at least one second yaw assembly plate (220) comprised of at least at
27 least one second yaw assembly plate(220) and at least one second top assembly plate
28 (221);
29 f. the at least one second yaw assembly plate (220) having a second yaw
30 assembly plate edge (222), an extension edge (223), a second yaw assembly plate top
(224) and a second yaw assembly plate bottom (225); the at least one second yaw

1 assembly plate edge (222) immovably affixed by edge affixing means at the yaw-roll
2 interface plate (310) at the yaw surface (314); the extension edge (223) distal from the
3 second yaw assembly plate edge (222); the at least second yaw assembly plate (211)
4 extending from the yaw-roll interface plate (310) outwardly from the yaw-roll
5 interface plate (310);

6 g. the at least one second top yaw assembly plate (221) having a second top yaw
7 assembly plate edge (242), an extension edge (243), a second yaw top assembly plate
8 top (244) and a second yaw top assembly plate bottom (245); the at least one second
9 yaw top assembly plate edge (242) immovably affixed by edge affixing means at the
10 yaw-roll interface plate (310) at the yaw surface (314); the extension edge (243) distal
11 from the second top assembly plate edge (242); the at least second top yaw assembly
12 plate (221) extending from the yaw-roll interface plate (310) outwardly from the yaw-
13 roll interface plate (310);

14 h. the at least one second yaw assembly plate (220) is immovably affixed by
15 immovable affixing means, at the yaw-roll interface plate (310) at the yaw surface
16 (314) proximal the yaw-roll interface plate bottom (312) and the at least one second
17 top assembly plate (221) is immovably affixed by immovable affixing means at the
18 yaw-roll interface plate (310) at the yaw surface (314) proximal the yaw-roll interface
19 plate top (311);

20 i. yaw interconnection means interconnecting the at least one first yaw
21 assembly plate (210) and the at least one second yaw assembly plate (220) by aligned
22 apertures, proximal the extension edges (213) and (233), receiving shaft
23 interconnection means (500) or yaw power by motor means (400) and motor shaft
24 means (410) or motor shaft means (410) with gear means (430);

25 j. yaw interconnection means interconnecting the at least one top yaw
26 assembly plate (211) and the at least one second top yaw assembly plate (221) by
27 aligned apertures, proximal the extension edges (233) and (243), receiving shaft
28 interconnection means (500) or yaw power by motor means (400) and motor shaft
29 means (410) or motor shaft means (410) with gear means (430).
30

- 1 8. A yaw, pitch and roll articulated assembly of claim 7 further comprising:
2 a. shaft interconnection means (500) comprised of nut and bolt (500)
3 connection means; yaw power by motor means (400) comprised of electric,
4 pneumatic or hydraulic motor means with shaft (410), key (420) and notch (425) or
5 shaft (410) and gear (430) drive means;
6 b. the first pitch interconnection plate (110), the pitch assembly attachment
7 plate (120), the at least one first yaw assembly plate(210), the at least one top yaw
8 assembly plate (211), the at least one second yaw assembly plate (220), the at least
9 one top second yaw assembly plate (221) the yaw-roll interface plate (310), and the
10 second roll interconnection plate (320) are substantially planar;
11 c. rotatable pitch interconnection affixing means (130) comprised of hinge
12 means (130); roll means comprised of first roll interconnecting means (330) received
13 by second roll interconnecting means (340).
14
- 15 9. A yaw, pitch and roll articulated assembly of claim 8 further comprising:
16 a. rotatable yaw power means comprised of a motor driving a motor shaft; the
17 motor stationarily fixed by stationary fixing means at either the first yaw assembly
18 plate top, the first yaw assembly plate bottom, the second yaw assembly plate top or
19 the second yaw assembly plate bottom; the motor shaft either directly or by gear
20 means torque connected to the shaft or shaft interrelated with gear interconnection;
21 b. first roll interconnecting means (330) comprised of threaded means
22 received by second roll interconnecting means (340) comprised of complementary
23 receiving threaded means; first roll interconnecting means (330) immovably affixed
24 to second roll interconnection plate (320) at a roll side (321); the second roll
25 interconnection plate (320) affixed by means to the second vehicle (20) at a roll-
26 vehicle side (322) .
27
- 28 10. A yaw, pitch and roll articulated assembly of claim 9 further comprising:
29 a. shaft or shaft interrelated with gear interconnection is key means
30 interrelated at the at least one first aperture or at the at least one second aperture by
shaft or aperture key received by shaft or aperture notch; means of transmitting yaw